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# A NEW SCALE-WORM COMMENSAL WITH DEEP-SEA MUSSELS ON THE GALAPAGOS HYDROTHERMAL VENT (POLYCHAETA: POLYNOIDAE)

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*Abstract.*—Some polynoid polychaetes, found living commensally in mantle cavities of deep-sea mussels on the Galapagos Rift vent area, are described as a new genus and new species, *Branchipolynoe symmytilida,* and referred to the new subfamily Branchipolynoinae. They are unusual in having well-developed arborescent branchiae. A series of young, juveniles, and adults allows observation of their growth stages.

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Among unusual animals discovered in submarine hydrothermal vents on the Galapagos Rift and collected by the submersible *Alvin* is a polynoid scale-worm found living commensally in mantle cavities of the giant deep-sea vent mussels. This association was noted earlier by Grassle *et al.* (1979:7) and Turner (1981: 5). According to this group, the abundant mussels found in the vicinity of active vents were hosts for the polynoid polychaetes. At some vents, almost all the mussels contained a polynoid symbiont in the mantle cavity, whereas at other vents they were rarely found; usually a large and small specimen were found together. Mussels with the polynoid commensals were collected on three vent areas: the Mussel Bed, named for the abundant mytilid bivalves, the Garden of Eden, named for its numerous and interesting forms, and the Rose Garden, named for the dense beds of red-tipped vestimentiferan worms living in white tubes (*Riftia pachyptila* Jones). The polynoids were observed leaving their hosts when the mussels were disturbed by the *Alvin* manipulator (Ballard and Grassle 1979: 600). On videotape, the blood-red polynoids can be seen leaving their hosts, swimming freely, scurrying about and hiding among the clusters of mussels. According to Dr. Vida C. Kenk (in litt.), who is describing the mussels, about one-third of the preserved specimens she examined contained a polynoid in the mantle cavity, usually in the posterior region. Gills of the mussels containing the polynoids were often thickened and uneven, possibly due to disturbance by the worms.

For the present study, specimens available were collected during 14 dives of the *Alvin* in 1979 (January–February, November–December) to about 2500 meters depth (2447–2495). Most of the polynoids were removed from the mussels by Isabelle Williams of the Woods Hole Oceanography Institution (WHOI). In addition, soft parts of five mussels with the polynoid commensals still in place in the mantle cavities were made available. Additional specimens of the same species, including many small ones, were separated from partially sorted mussel washings, washings from a clam box with mussels, rubble residue, and vestimentiferan washings from the Galapagos area.

Types and additional specimens are deposited in collections of the Department of Invertebrate Zoology, Smithsonian Institution (USNM).

Branchipolynoinae, new subfamily
*Branchipolynoe,* new genus

*Type-species.*—*Branchipolynoe symmytilida,* new species.

*Gender.*—feminine.

*Diagnosis.*—Body short, flattened, spindle-shaped, segments 21, first achaetous. Elytra and elytrophores, 10 pairs on segments 2, 4, 5, 7, 9, 11, 13, 15, 17 and 19. Dorsal cirri on non-elytra-bearing segments with short cirrophores and short styles. Dorsal tubercles on cirrigerous segments indistinct. Branchiae well developed, arborescent, on all parapodia from segment 2. Prostomium bilobed, subtriangular anterior lobes bearing minute frontal filaments; with short median antenna and pair of short palps; without lateral antennae and eyes. First or tentacular segment fused to prostomium, visible dorsally as short ring, achaetous; stout tentaculophores lateral to prostomium with 2 pairs of short tentacular cirri; without facial tubercle. Second or buccal segment with first pair of elytra and short ventral buccal cirri. Parapodia subbiramous. Notopodia small, with few short acicular notosetae. Neuropodia short, truncate, without projecting acicular lobes; with very numerous neurosetae including upper stout, slightly hooked ones separated by partition from very numerous slender ones. Ventral cirri short. Pygidium with pair of short anal cirri. Pharynx with 5 pairs of papillae and 2 pairs of jaws. Enlarged ventral papillae on segments 11 and 12. Commensal with mussels on deep-sea thermal vents.

*Etymology.*—*Branchia,* gills, plus *polynoe,* polynoid worm, (from genus *Polynoe*); referring to the characteristic gills on the polynoid worm.

*Branchipolynoe symmytilida,* new species
Figs. 1–8

*Material.*—East central Pacific, from dives of the *Alvin* on 3 vent areas along the Galapagos Rift in 1979, associated with deep-sea mussels:

MUSSEL BED, 00°47.89′N, 86°09.21′W: Dive 879-1, 20 Jan, 2495 m, paratype (USNM 80627). Dive 880-24, and mussel washings, 21 Jan, 2493 m, 3 paratypes (USNM 80628, 80629) and 2 specimens from mussel washings (USNM 81255). Dive 887-12, 12 Feb, 2488 m, paratype (USNM 80630) and young specimen from mussel washings (USNM 81256). Dive 895, 20 Feb, 2482 m, 2 young from washings and clam box washings (USNM 81257). Dive 991-58, 59, 8 Dec, 2490 m, 2 paratypes (USNM 80634) and 5 young from mussel washings (991-121, USNM 81258).

GARDEN OF EDEN, 00°47.69′N, 86°07.74′W: Dive 883-L3, 24 Jan, 2492 m, paratype (USNM 80624). Dive 884-2, 6, 11, 25 Jan, 2482 m, 3 paratypes (USNM 80625, 80626) and 6 young from clam bucket with mussels and rubble residue (USNM 81263).

ROSE GARDEN, 00°48.25′N, 86°13.86′W: Dive 890-28, 32, 15 Feb, 2447 m, 2 paratypes (USNM 80622). Dive 892-5, 17 Feb, 2454 m, paratype (USNM 80623). Dive 894-14, 17, 19, 20, 21, 23, 31, 19 Feb, 2457 m, 7 paratypes (USNM 80631). Dive 896-1, 7, 16, 21 Feb, 2460 m, 3 paratypes (USNM 80632) and 2 young from Instant Ocean washings (896-22, USNM 81260). Dive 983, 30 Nov, 2457 m, holotype (983-73, USNM 80615); paratype (983-81, USNM 80616);

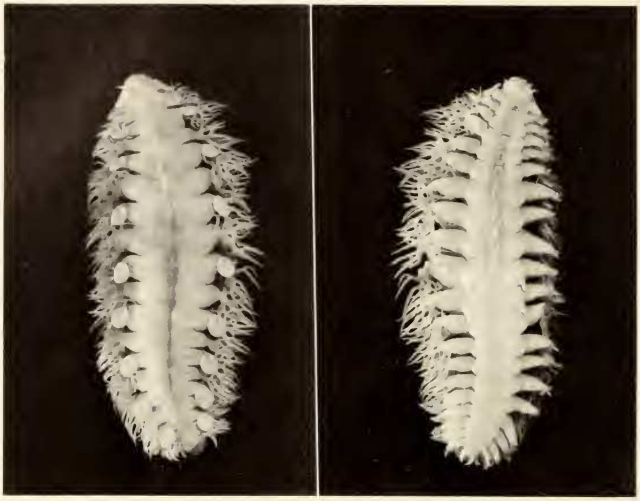

Fig. 1. *Branchipolynoe symmytilida*, holotype, USNM 80615 (983-73): Dorsal view, left; ventral view, right. 2×.

paratype (983-34A, USNM 80620); 2 paratypes (983-34B, C, USNM 80621); 12 paratypes (983-16, 18, 30, 52, 53, 64, 66, 74, 80, 86, 90, 109, USNM 80633); 2 paratypes (983-85, USNM 80617); 2 paratypes (983-87, USNM 80618); 3 paratypes (983-102, USNM 80619); 1 specimen from washings (983-112, USNM 81261). Dive 984-32, 1 Dec, 2451 m, 6 young from mussel washings (USNM 81259). Dive 990-41, 7 Dec, 2451 m, 4 young from vestimentiferan washings (USNM 81262).

*Measurements.*—Holotype (USNM 80615, 983-73) 37 mm long, 18 mm wide, including branchiae, with 21 segments. Largest paratype (USNM 80627, 879-1) 42 mm long, 18 mm wide, 21 segments.

*Description.*—The body is short, spindle-shaped, slightly tapered anteriorly and posteriorly, flattened ventrally and strongly arched dorsally (Fig. 1). Fully-developed worms have 21 segments, the first achaetous, with 10 pairs of elytra on segments 2, 4, 5, 7, 9, 11, 13, 15, 17 and 19. The elytra are small, oval, and leave the greater part of the dorsum uncovered (Figs. 1, 2A). They are attached to low elytrophores, the first pair in the central part of the elytron, the following ones eccentrically, near their anterior borders (Fig. 2C–E). The elytra are rather thick, opaque and lack tubercles and papillae. The dorsal cirri on the non-elytra-bearing segments have short cylindrical cirrophores and short tapered styles with slender tips. They are attached posterior to the small notopodia and extend to about the

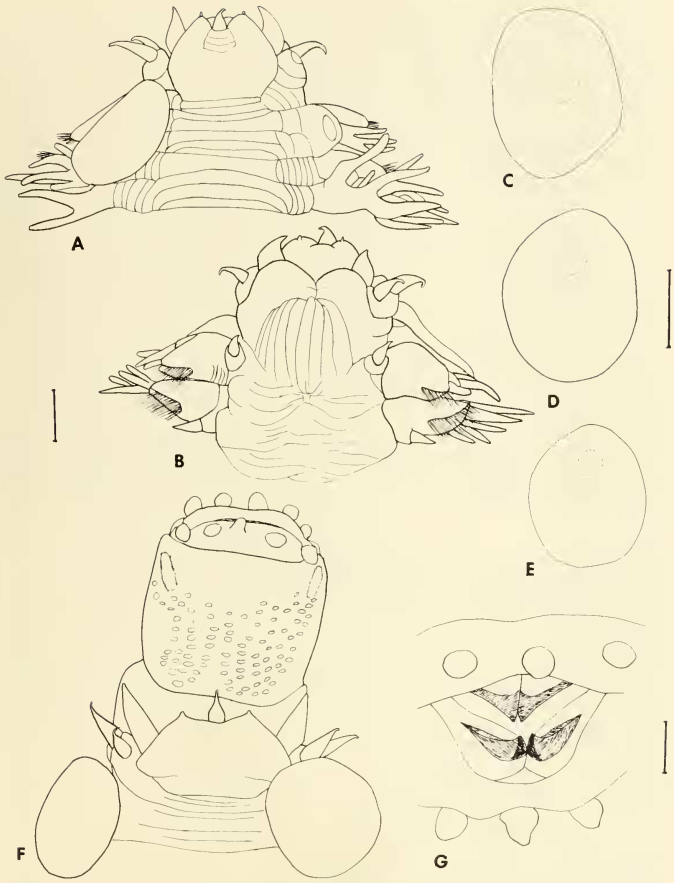


Fig. 2. *Branchipolynoe symmytilida*, A–E, holotype, USNM 80615 (983-73); F–G, paratype, USNM 80616 (983-81); A, Dorsal view of anterior end, style of right dorsal tentacular cirrus and right elytron on segment 2 broken off; B, Ventral view of anterior end; C, Right first elytron from segment 2; D, Right sixth elytron from segment 11; E, Right tenth elytron from segment 19; F, Dorsal view of anterior end, pharynx extended; G, Frontal view of pharynx slit open, showing jaws and medial papillae. Scales = 1.0 mm for A, B, F; 1.0 mm for C–E; 0.5 mm for G.

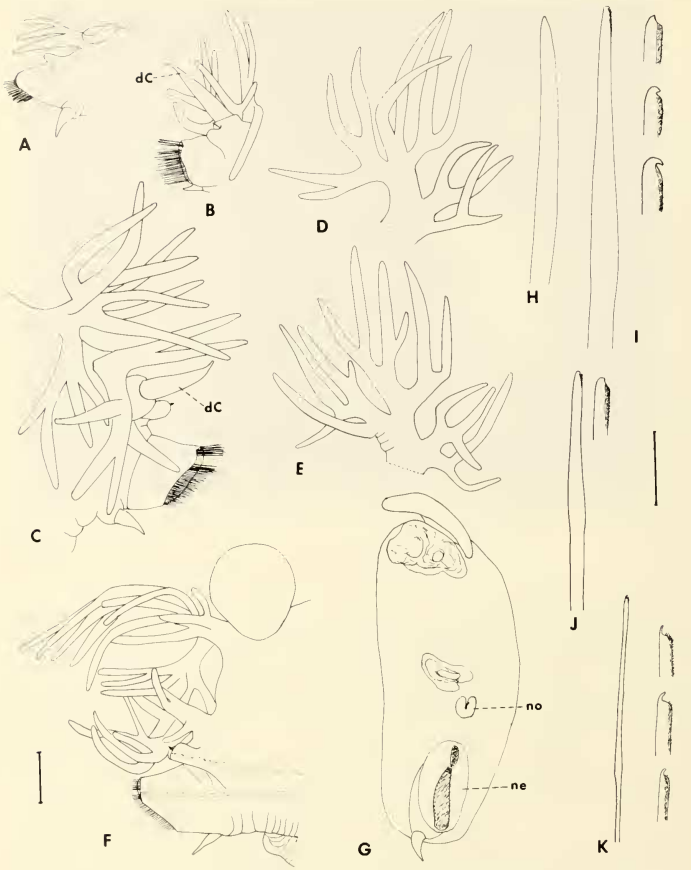


Fig. 3. *Branchipolynoe symmytilida*. A–F, H–K, holotype, USNM 80615 (983-73); G, paratype, USNM 80627 (879-1): A, Right elytragerous parapodium from segment 2, anterior view, elytron removed; B, Right cirrigerous parapodium from segment 3, anterior view; C, Right cirrigerous parapodium from segment 8, posterior view; D, Lower branchia from same; E, Upper branchia from same; F, Right elytragerous parapodium from segment 13, anterior view, acicula and neuropodial acicular lobe dotted; G, Diagrammatic end view of same, only bases of branchiae shown; H, Notoseta; I, Neuroseta from upper group with detail of three tips enlarged; J, Upper stout neuroseta from lower group, with tip enlarged; K, Slender neuroseta from lower group with detail of three tips enlarged. Scales = 1.0 mm for A–G; 0.1 mm for H–K. dC, dorsal cirrus; ne, neuropodium; no, notopodium.

tips of the setae (Fig. 3B, C). Dorsal tubercles on the cirrigerous segments are indistinct. Branchiae are well developed, arborescent, with long filaments. They emerge from the body in 2 main short trunks, a lower smaller group dorso-posterior to the notopodia and an upper large one more medial and near the elytrophores and dorsal tubercles (Fig. 3C–G). The branchiae begin on segment 2 as a single small group lateral to the elytrophore (Fig. 3A); they become larger, with more numerous branches and occur on all the following segments.

The prostomium is relatively small and bilobed, with subtriangular anterior lobes bearing minute frontal filaments. The median antenna has the ceratophore fused to the prostomium and is rather indistinct; the short subulate style in the anterior notch extends only slightly beyond the prostomium; the lateral-ventral palps are short, thick, and tapered, and extend slightly beyond the prostomium; lateral antennae and eyes are lacking (Fig. 2A, B, F). The first or tentacular segment is fused to the prostomium; the tentaculophores lateral to the prostomium are short and bulbous, each with a pair of tentacular cirri; the dorsal ones are about the length of the palps, the ventral ones slightly shorter; setae and facial tubercle are lacking. The tentacular segment is visible dorsally as a short ring and contributes ventrally to the lateral and posterior lips of the ventral mouth (Fig. 2B).

The thick muscular pharynx was extended on 2 specimens. There are 5 pairs of dorsal and ventral soft, delicate, sac-like papillae around the opening; subdistally on each side there is a dorsal and ventral raised diagonal area; more proximally a rather indistinct papillate area is followed by a smooth proximal area near the prostomium (Fig. 2F). The 2 pairs of jaws are rather small, light amber-colored, and lack denticulated bases (Fig. 2G).

The parapodia of segment 2 are subbiramous and bear the first pair of elytra. The ventral or buccal cirri are attached basally on the neuropodia, lateral to the ventral mouth (Fig. 2B). The buccal cirri are short, similar in length to the following ventral cirri (not extra long, as usually found in the Polynoidae). A single branchia with 3 branches is attached to the lateral side of the elytrophore; the notopodium is short, digitiform and lacks notosetae (Fig. 3A).

The following parapodia are subbiramous, short, thick and hidden from view dorsally by the well-developed branchiae (Fig. 3B–G). The notopodia are much shorter than the neuropodia; they are nodular to digitiform, curled dorsally, forming a slit on the upper side that encloses a few (1–3) scarcely projecting, dark amber-colored, stout, smooth and slightly tapered notosetae (Fig. 3H). The larger and stouter neuropodium, enclosing the inner conical acicular lobe, ends distally in a smaller upper truncate part and a larger obliquely truncate lower part; the distal tip of the acicular lobe forms an internal partition separating the neurosetae into upper and lower groups (Fig. 3F, G). The tips of the neurosetae scarcely project beyond the neuropodium. The upper (supra-acicular) neurosetae (about 11–13) are light amber-colored, stout, wider basally and gradually taper to blunt, slightly hooked tips; they are essentially smooth except for some indistinct distal serrations (Fig. 3I). The lower (subacicular) and larger group of neurosetae are very numerous; a small upper group (about 8) are similar to the supra-acicular neurosetae but about half as stout (Fig. 3J); the numerous remaining neurosetae are very slender and colorless, with slender notched, hooked tips and minute distal serrations (Fig. 3K). The ventral cirri, attached to the middle of the neuropodia, are short, not reaching the tips of the neuropodia (Fig. 3C, F).

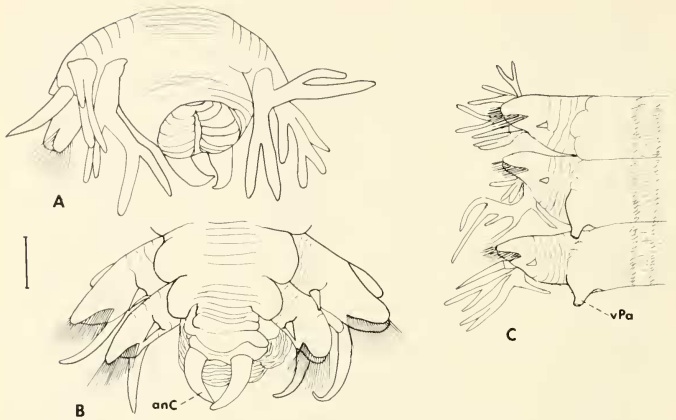


Fig. 4. *Branchipolynoe symmytilida,* A, paratype, USNM 80616 (983-81); B, C, holotype, USNM 80615 (983-73); A, Dorsal view of posterior end showing segment 21 and pygidium, with anus open; B, Ventral view of posterior end showing segments 20, 21 and pygidium, with protruding anal bulge; C, Ventral view of right side of segments 10 to 12. Scale = 1.0 mm for A–C. anC, anal cirrus; vPa, ventral papilla.

The pygidium, with the terminal anus, is rather large and bulbous. It is enclosed in the parapodia, longer dorsal cirri, and branchiae of the last segment; the ventral anal cirri are stout, short and curved medially (Fig. 4A, B). When the anus is open, ridged vascular areas are visible, sometimes appearing as a protruding anal bulge (Fig. 4B).

Distinct segmental or nephridial papillae are not present, except for 2 pairs of large ventral papillae on segments 11 and 12 that project posteriorly (Figs. 1, 4C).

*Etymology.*—Neo-Latin adjective from *sym*-"with," plus *mytilida*-"mytilid mussel," in reference to association with mytilids.

## Developmental Variations

1. Adult with extra small elytra and upper neurosetae larger, darker and fewer in number (Fig. 5A–F).—The adult paratype (USNM 80630) from Dive 887-12 is 31 mm long, 14 mm wide, with 21 segments and enlarged ventral papillae on segments 11 and 12. The 10 pairs of elytra are very small, much smaller than on the figured holotype (Fig. 5A). The branchiae have more numerous branches (Fig. 5C). The upper group of neurosetae are fewer in number (1–2) and much stouter and darker amber-colored (Fig. 5A, B, D). The upper neurosetae of the lower group are also fewer in number (1–2) stout, wider subdistally, with slightly hooked tips (Fig. 5E) and are similar in shape to those of younger specimens (see below).

2. Juvenile with 20 segments and 9 pairs of elytra (Fig. 6A–K).—The paratype (USNM 80620) from Dive 983-34A is 12 mm long, 5 mm wide, with 20 segments,

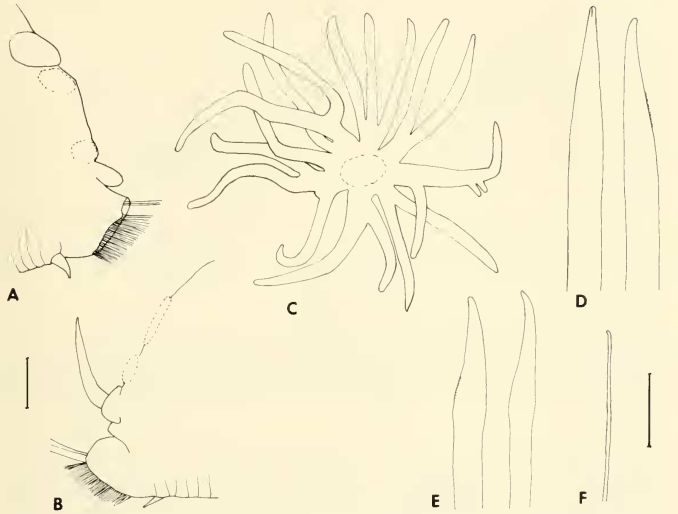


Fig. 5. *Branchipolynoe symmytilida*, paratype, USNM 80630 (887-12): A, Right elytragerous parapodium, posterior view; two groups of branchiae cut off (bases dotted); B, Right cirrigerous parapodium, anterior view; two groups of branchiae cut off (bases dotted); C, Upper branchia from same; D, Two neurosetae from upper group; E, Two neurosetae from upper part of lower group; F, Slender neuroseta from lower group. Scales = 1.0 mm for A–C; 0.1 mm for D–F.

the last one very small; elytra are lacking on segment 19. The 9 pairs of elytra are larger in proportion to the size of the body and cover more of the dorsum (Fig. 6A, B). They are somewhat more delicate and show faint "veining" (Fig. 6D, E). The branchiae occur in the usual 2 groups but have fewer branches (Fig. 6F–H). The notopodia appear to be larger in proportion to the neuropodia, with up to 3 stout notosetae (Fig. 6F, I). The neuropodia are rounded distally, bearing only 2 upper stout neurosetae with slightly hooked tips (Fig. 6J) and numerous lower slender neurosetae (Fig. 6K). Enlarged ventral papillae occur only on segment 12.

3. Juvenile with 18 segments and 9 pairs of elytra (Fig. 7A–E).—The paratype (USNM 80626) from Dive 884–6 is 5 mm long, 3 mm wide, with 18 segments and 9 pairs of elytra. The upper 2 neurosetae are stout and strongly hooked (Fig. 7A, B, D), the lower ones slender, hooked and distally serrated (Fig. 7E). There are no enlarged ventral papillae.

4. Young with 14 segments and 7 pairs of elytra (Fig. 8A–F).—A small paratype (USNM 80628) collected from mussel washings on Dive 880 has 14 segments, the last one very small; it is 2.5 mm long, 1.5 mm wide, including setae, with 7

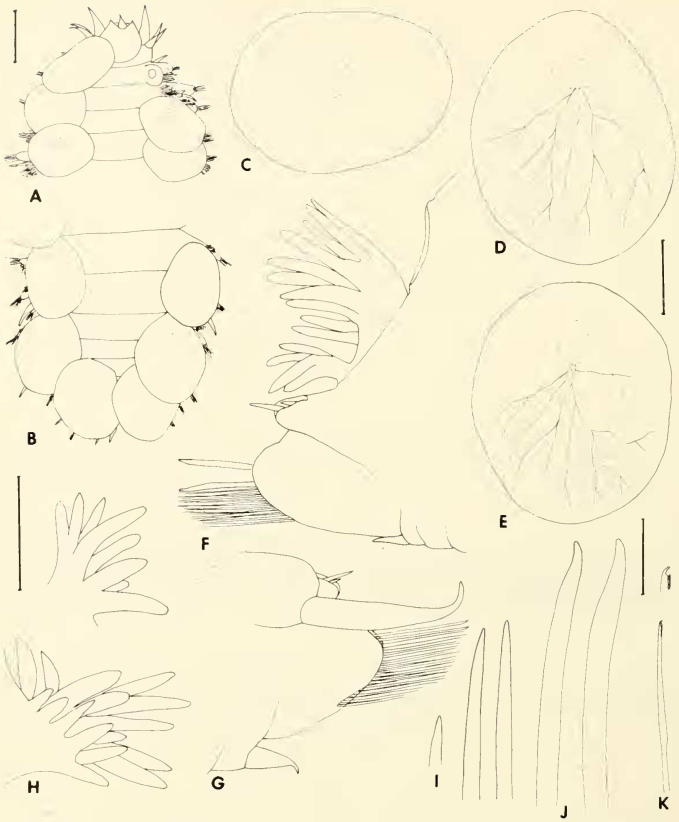


Fig. 6. *Branchipolynoe symmytilida*, juvenile paratype, USNM 80620 (983-34A): A, Dorsal view of anterior end, first right elytron removed; B, Dorsal view of posterior end; C, Right first elytron from segment 2; D, Right fifth elytron from segment 9; E, Right ninth elytron from segment 17; F, Right elytragerous parapodium from segment 9, anterior view, elytron removed; G, Right cirrigerous parapodium from segment 8, posterior view, branchiae cut off; H, Upper and lower branchiae from same; I, Three notosetae; J, Two upper neurosetae; K, Lower neuroseta, with detail of tip. Scales = 1.0 mm for A, B; 0.5 mm for C–E; 0.5 mm for F–H; 0.1 mm for I–K.

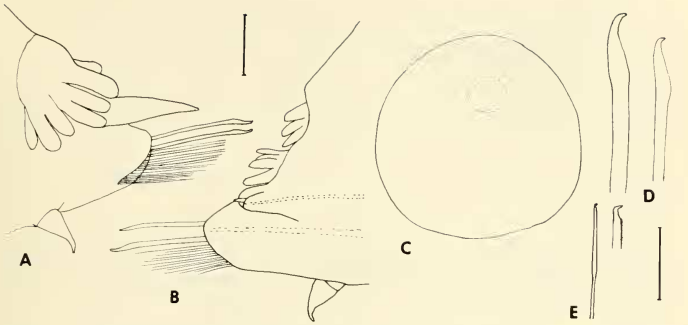


Fig. 7. *Branchipolynoe symmytilida*, juvenile paratype, USNM 80626 (884-6): A, Right cirrigerous parapodium, posterior view; B, Right elytragerous parapodium, anterior view, acicula dotted; C, Elytron; D, Upper and middle neurosetae; E, Lower neuroseta with detail of tip. Scales = 0.2 mm for A–C; 0.1 mm for D, E.

pairs of elytra. Branchiae are just beginning to be developed (Fig. 8C). The neurosetae are few in number: 3 upper and middle stouter ones with hooked tips (Fig. 8E) and 5 lower more slender ones (Fig. 8F).

## Association of Commensal Polynoids with Deep-Sea Mussels

Forty-seven polynoids were removed from the mantle cavities of 41 mussels, one per mussel except for two that harbored two polynoids and two that each contained three polynoids (Table 1). Thirty-two mussels were collected in the area referred to as Rose Garden, 4 in the Garden of Eden and 5 in the Mussel Bed. Two additional polynoids were collected in mussel washings from the Mussel Bed. The shell lengths of the mussels ranged from 33.8 to 152.0 mm (measured by I. P. Williams, WHOI). The polynoids ranged in length from 2 mm (young, in mussel with shell length of 80 mm) to 42 mm (adult, in mussel with shell length of 135 mm). There was no consistent correlation between lengths of the polynoids and the mussels. Thus, the largest mussel with a shell length of 152 mm contained a polynoid of only 12 mm in length.

Of the 49 available polynoids associated with the deep-sea mussles, 30 are considered to be adults, having the full number of 21 segments, 10 pairs of elytra on segments 2, 4, 5, 7, 9, 11, 13, 15, 17 and 19, and two pairs of large ventral papillae on segments 11 and 12 (Figs. 1–5). They vary in length from 10 to 42 mm and in width from 5.5 to 19.0 mm. All but one of them were removed from mussels with shell lengths of 44.9 to 152.0 mm. The other polynoid, an adult of 24.0 mm in length and 8.5 mm in width, was collected in mussel washings from Dive 880.

The remaining 19 polynoids are considered to be juveniles or young. Twelve polynoids in this group, so-called juveniles (Fig. 6), have 20 segments, 9 pairs of

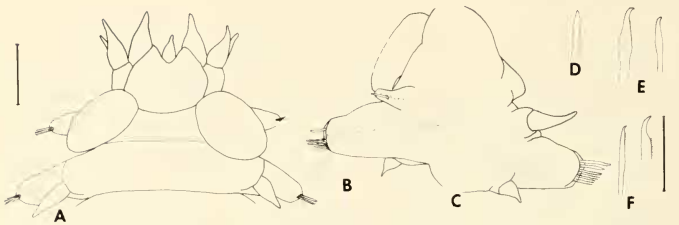


Fig. 8. *Branchipolynoe symmytilida*, young paratype, USNM 80828 (880-mussel washings): A, Dorsal view of anterior end; B, Right elytragerous parapodium, anterior view, acicula dotted; C, Right cirrigerous parapodium, posterior view; D, Notoseta; E, Upper and middle neurosetae; F, Lower neuroseta with detail of tip. Scales = 0.2 mm for A–C; 0.1 mm for D–F.

elytra, and a pair of large ventral papillae on segment 12 only, with three exceptions: one (890-28) has ventral papillae on both segments 11 and 12; one (983-90) has 21 segments but with the last 2 very small, and lacks ventral papillae; and one (983-102A) has 21 segments, the last 2 very small. They vary in length from 9 to 17 mm and in width from 4.5 to 8.0 mm. They were removed from mussels with shell lengths of 33.8 to 133.2 mm. Four younger juveniles (Fig. 7) have 18 segments, 9 pairs of elytra; ventral papillae are lacking. Lengths vary from 5.0 to 5.5 mm and widths from 2.5 to 3.0 mm. They were found in mussels with the shell lengths of 50.9 to 96.0 mm. The three youngest polynoids (Fig. 8) have 12 to 14 segments, 6 to 7 pairs of elytra and also lack ventral papillae. Lengths are 2 to 3 mm and widths 1.2 to 1.5 mm. Two of them (983-102) were found in a mussel with a shell length of 80.0 mm, the other (880), in mussel washings.

Among a collection of unsorted polynoids from the Galapagos Rift, also collected in 1979 and sent to me later, some additional specimens of the commensal *B. symmytilida* were found. These included 3 adults collected in mussel washings from the Mussel Bed and washings from the Rose Garden area, as well as 26 young specimens: 6 from a clam bucket with mussels and rubble residue in the Garden of Eden, 8 from mussel washings in the Mussel Bed, and 12 from Instant Ocean, mussel and vestimentiferan washings in the Rose Garden. They included the smallest specimens examined, consisting of 10 to 14 segments, 1 to 2 mm in length and 0.7 to 1.5 mm in width. It was possible to separate the minute young of *B. symmytilida* from the young of the other polynoids found in the same collections by their characteristic short antenna, palps, tentacular and dorsal cirri, as well as by their neuropodia with relatively few stout hooked neurosetae (Fig. 8).

For the four mussels found harboring more than one polynoid commensal, one (983-87) contained an adult and young, one (983-34) an adult and 2 juveniles, one (983-102) a juvenile and 2 young, and one (983-85) 2 young (Table 1).

Most of the commensal polynoids were removed from the deep-sea mussels at WHOI by I. P. Williams, with the vent area, *Alvin* dive and mussel number, and

Table 1.—Data on four deep-sea mussels harboring more than one polynoid commensal.

| *Alvin* dive-mussel no. | Mussel shell length (mm) | Polynoid commensal *Branchipolynoe symmytilida* | | | | | |
|---|---|---|---|---|---|---|---|
| | | No. segments | No. elytral prs. | Length (mm) | Width (mm) | Ventral papillae on segments | USNM cat. no. |
| 983-87 | 96.0 | A 21 | 10 | 24 | 12 | 11 & 12 | 80618 |
| | | Y 18 | 9 | 5.5 | 3 | None | |
| 983-34 | 133.2 | A 21 | 10 | 33 | 14 | 11 & 12 | 80621 |
| | | J 20 | 9 | 10.5 | 4.5 | 12 | (B) (C) |
| | | J 20 | 9 | 12 | 5 | 12 | 80620 (A) |
| 983-102 | 80.0 | J 21* | 9 | 13.5 | 6.5 | 12 | 80619 |
| | | Y 14* | 7 | 3 | 1.5 | None | |
| | | Y 12 | 6 | 2 | 1.2 | None | |
| 983-85 | 50.9 | Y 18 | 9 | 5 | 2.5 | None | 80617 |
| | | Y 18 | 9 | 5 | 2.5 | None | |

A, Adult; J, Juvenile; Y, Young.
* Last 2 segments very small and incomplete.
*Alvin* dive 983 in Rose Garden area.

shell length indicated. Soft parts of five mussels with the commensal polynoids still present in the mantle cavities of the host were sent to me. The data are summarized in Table 2. Three of the commensals are considered to be adults, having the full number of 21 segments and 10 pairs of elytra, and as well as 2 pairs of ventral papillae on segments 11 and 12. The other two are juveniles, with only 9 pairs of elytra and 20 segments (or 21, with the last two very small) and a single pair of ventral papillae on segment 23 (not on 11) or lacking altogether. The commensal polynoids were found occupying the anterior and ventral parts of the mantle cavity, anterior to the byssus threads. In one case, the polynoid was wrapped around the foot of the mussel.

A number of studies have been carried out dealing with the unnamed deep-sea mytilid mussels from the Galapagos Rift. Rau and Hedges (1979:649) suggested a chemosynthetic food source for the mussels and other filter feeders in the proximity of the vents. Lutz, Jablonski, Rhoads, and Turner (1980:127) presented evidence which strongly suggests that the mytilid host for the polynoid possesses a demersal planktotrophic larval stage with relatively long planktonic existence and that the unusual biological and physico-chemical conditions (such as high microbial densities, elevated water temperature and hydrogen sulfide concentrations) might very well provide a stimulus to larval settlement and concentration of relatively sedentary organisms in and around these geographically isolated deep-sea hydrothermal vents. Rhoads, Lutz, Cerrato and Revelas (1982) studied the mytilid mussels at the hydrothermal vents in connection with growth and predation activity. The largest mussel collected, with a shell length of 184 mm, was estimated to be 19 ± 7 years old, based on results of transplant mark and recapture experiments. Mussels less than 20 mm in length showed damage from predation by the vent crab *Bythograea thermydron* Williams. They concluded that the

Table 2.—Data on five commensal polynoids removed from five deep-sea mussels.

| *Alvin* dive-mussel no. | Deep-sea mussel | | Polynoid commensal *Branchipolynoe symmytilida* | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Shell length (mm) | Soft parts length × height (mm) | No. segments | No. elytral prs. | Length (mm) | Width (mm) | Ventral papillae on segments | USNM cat. no. |
| 983-18 | 116.6 | 72 × 48 | A 21 | 10 | 38 | 14 | 11 & 12 | 80633 |
| 991-59 | 67.0 | 42 × 30 | A 21 | 10 | 16 | 7 | 11 & 12 | 80634 |
| 983-16 | 48.5 | 30 × 17 | A 21 | 10 | 12 | 6 | 11 & 12 | 80633 |
| 983-74 | 62.6 | 36 × 22 | J 20 | 9 | 16 | 8 | 12 | 80633 |
| 983-90 | 67.0 | 40 × 21 | J 21* | 9 | 14 | 6 | None | 80633 |

A, Adult; J, Juvenile.
* Last 2 segments very small and incomplete.
*Alvin* dive 983 in Rose Garden area; Dive 991 in Mussel Bed.

mytilids have a high growth rate, with a relatively long life span, and continue to grow throughout life, fed by dense chemosynthetic microbes associated with the vents.

*Remarks.*—Based on the structure of the prostomium and tentacular segment, *Branchipolynoe* could have been placed in the subfamily Macellicephalinae Hartmann-Schröder, as revised by Pettibone (1976, 1979) and Levenstein (1982) or in Lepidonotopodinae Pettibone (1983), having the prostomium bilobed with short frontal filaments on the anterior lobes, a median antenna with the ceratophore in the anterior notch, without lateral antennae, and with paired palps and two pairs of tentacular cirri lateral to the prostomium. *Branchipolynoe* differs from all the genera in the above two subfamilies in having well-developed arborescent branchiae, very small notopodia with only a few short, stout notosetae, truncate neuropodia without projecting acicular lobes and neurosetae of different type and distribution.

The presence of well-developed arborescent branchiae is an unusual feature in the Polynoidae. Branchiae in the form of simple digitiform extensions or pustules are known in some species, such as *Chaetacanthus* and *Euphione.* The great development of arborescent branchiae in *Branchipolynoe* may be another example of an adaptation to an environment that can be low in dissolved oxygen, as pointed out by Williams (1980:465) for the vent crab *Bythograea thermydron,* which has capacious branchial areas with large afferent and efferent branchial openings. Another example is the elaborate vascularization of the obturacular plume of the vestimentiferan *Riftia pachytila* (Jones 1981:1309).

*Branchipolynoe symmytilida* shows a number of features connected with its commensalism, such as small elytra that leave a large part of the dorsum uncovered, and smooth elytra lacking tubercles. The short stubby head appendages and dorsal and anal cirri suggest an adaptation for living in the large mantle cavities of the mytilid host, a fine place to escape from predators, such as crabs, shrimps, and fishes.

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